Operating Instructions
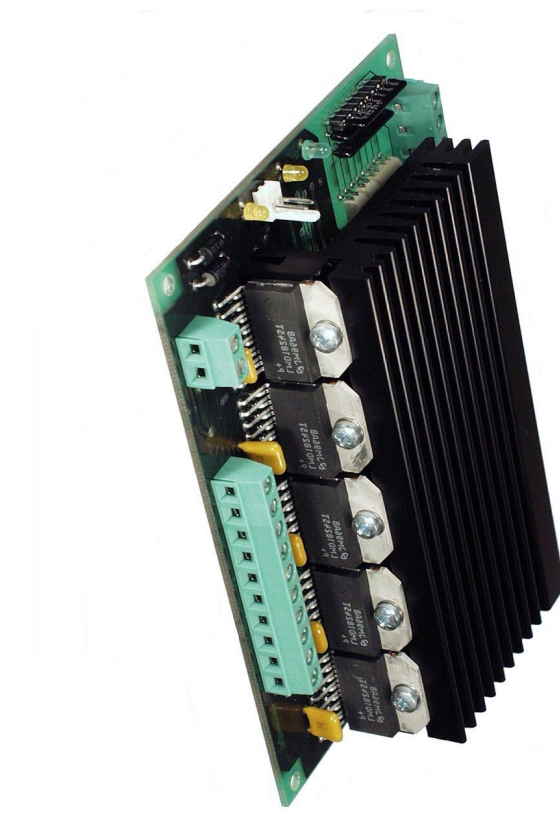
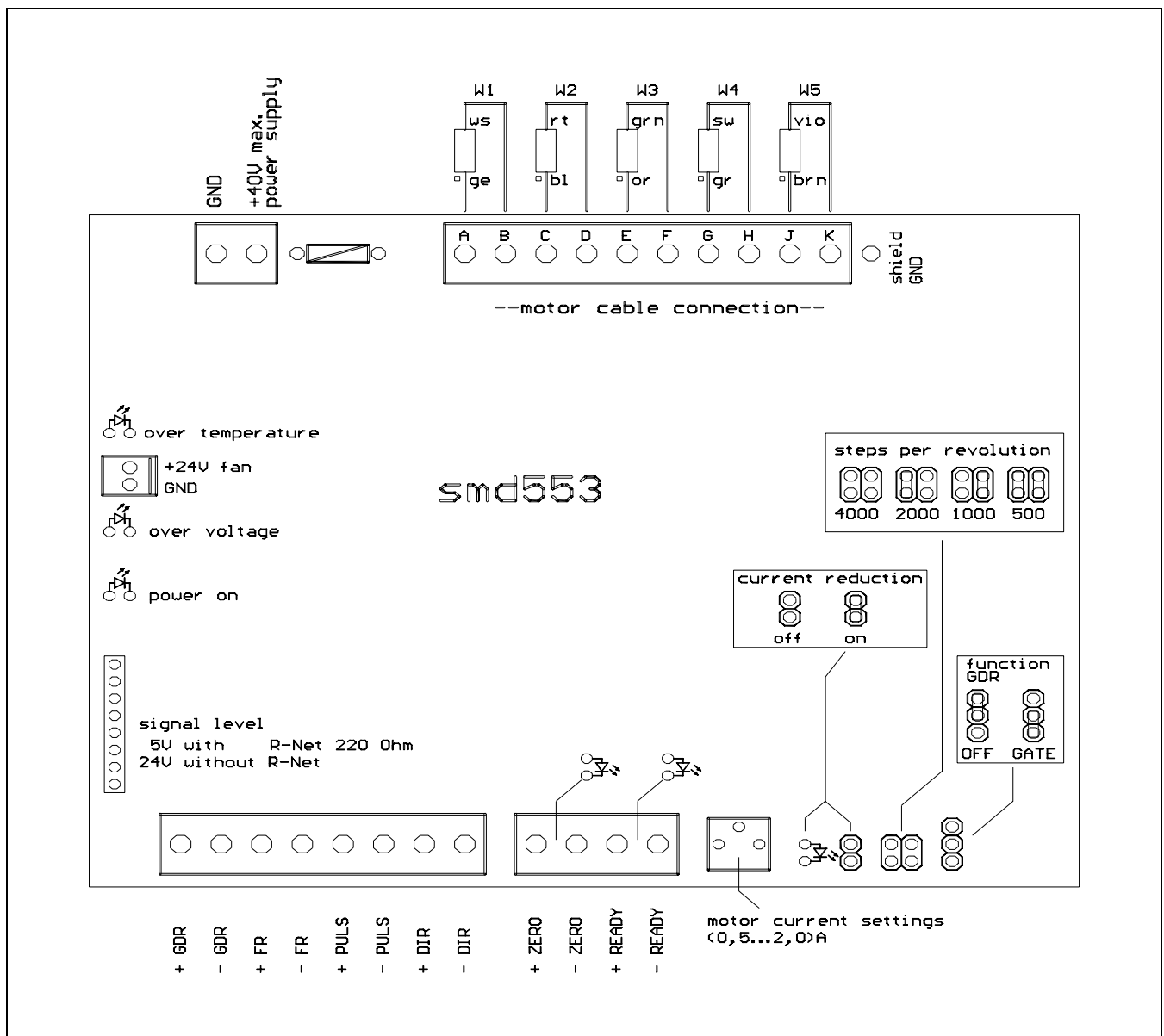## 5-Phase Stepping Motor Drive

smd553

Product Features

- For all common 5-Phase stepping motors
- Powerful power drive: bipolar, chopped, low noise and little losses
- Very compact size: L:W:H (125:100:35) mm
- Only one operating voltage of 21 Volt to 40 Volt required
- Motor current setting with scaled potentiometer (1,0 to 2,5) A
- 4000, 2000, 1000, and 500 steps/revolution
- Automatic current reduction can be enabled
- Active ballast circuit against over voltage
- Integrated fan control at over temperature
- All connection with robust screw terminal technology
- Inputs: Pulse, Direction, Fast Run, Gate/Off, Reset,

- Outputs: Zero position (Index), Ready, Fan control
- All signals are galvanically isolated with opto couplers
- Step frequency up to 100 kHz
- LED-display for Power, Ready, Zero position, Over-temperature, Ballast circuit, Current reduction
- Protection against Over-temperature, Over-current and Voltage surge (integrated active ballast circuit)
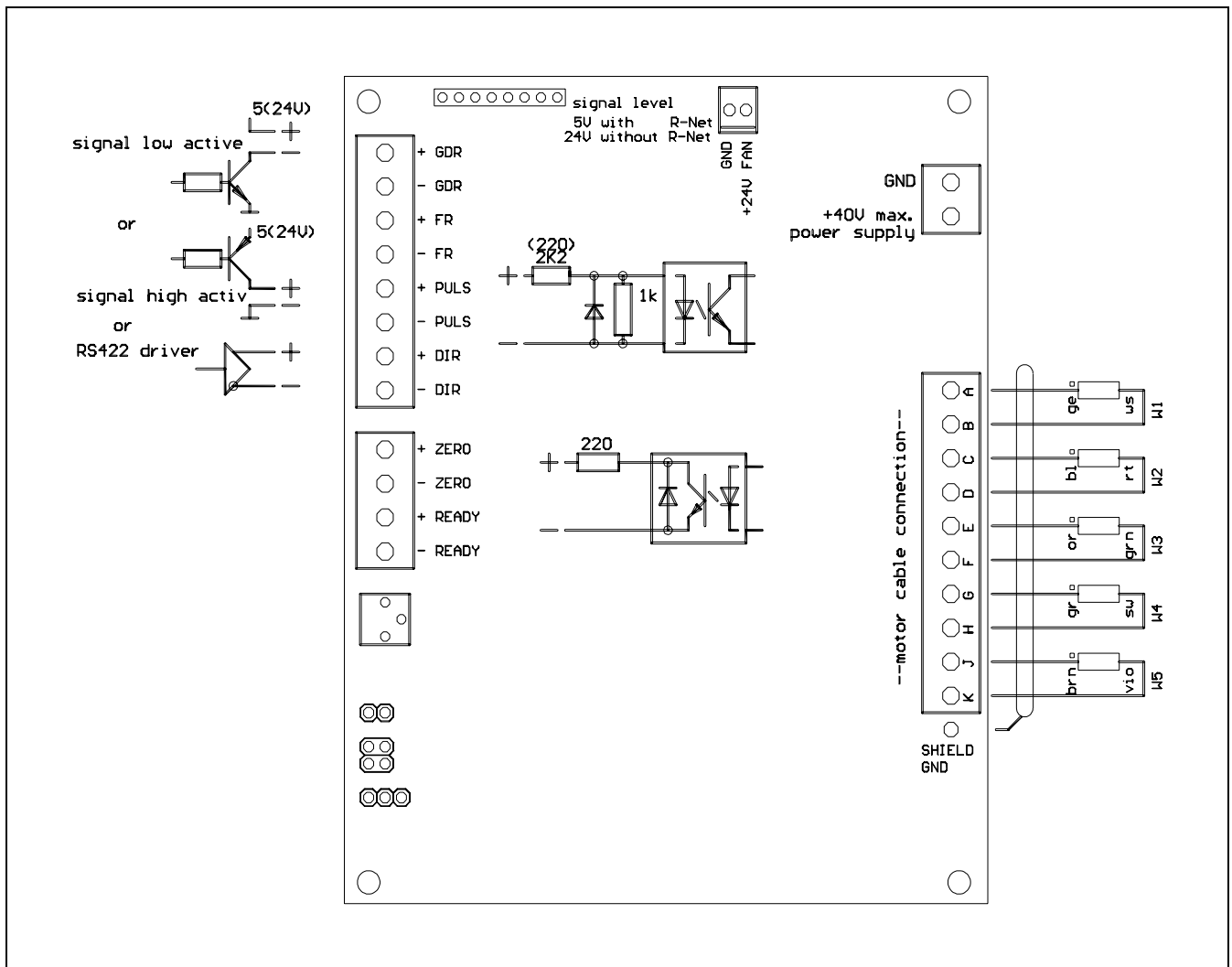
Options:
- 5V or 24V signal interface
- Function Gate(Gate) or Off(Power drive off) selectable via jumpers
- Fan module for operation with high motor current

Location of the control elements

Wring Diagram

signal low active

or

signal high activ

or

RS422 driver

5(24U)

5(24U)

signal level
5U with R-Net
24U without R-Net

GND +24U FAN

GND

+40V max.
power supply

+ GDR
– GDR
+ FR
– FR
+ PULS
– PULS
+ DIR
– DIR

+ ZERO
– ZERO
+ READY
– READY

(220)
2K2

1k

220

--motor cable connection--

A
B
C
D
E
F
G
H
J
K

SHIELD
GND

ge ws W1
bl rt W2
or grn W3
gr sw W4
brn vio W5

Function Description

GDR: (GATE, POWER DRIVE_OFF, RESET)
The function of the input GDR depends on the jumper setting „OFF" or „GATE".

Function GATE: (Jumper set to „GATE")
All pulses are ignored by the power drive is the input GDR is active. With this function it is possible to operate multiple power drive with one pulse source.

Function POWER DRIVE_OFF: (Jumper set to „OFF")
The active signal switches off the motor current, so that the motor shaft can be easily manually moved. However, the internal step counter is not deleted with this function.

Function RESET: (Always active)
Switches from the error condition to the operating condition

FR: (Fast Run)
A lower step resolution is selected if the input is activated. The effect is that the right jumper setting becomes active: The has the following effect on the step rate:
  - 4000 -> 1000
  - 2000 -> 500
  - 1000/500 -> no effect

!Attention:
Switching is only possible without offset in the so-called zero position. This zero position is automatically set at power drive on and is indicated via LED and output.

PULSE:

With a positive signal a step is moved. The power drive reacts only on signal edges. With active current reduction (Jumper „current reduction" inserted) and pulse interruptions for more than approx. 100ms, the motor current is reduced to approx. 60% of the set value.

The current reduction does not work if the pulse signal remains static active.

DIR: (DIRECTION)
The direction signal sets the motor sense of rotation.

READY: (Readiness)
This output is active when power drive operates error free. The following errors switch the output to high impedance:
   Over-voltage, Over-temperature

ZERO: (Zero position)
The output „ZERO" or zero position can be used for an exact reference point. This output becomes active in the so-called zero position, which is set at power-on and which is always a half step position. The output is switched active as follows: 4000/80, 2000/40, 1000/20 500/10, on condition that the movement is always in the same direction. The zero position is indicated with the LED „ZERO".

FAN:
The output „FAN" becomes active at a heat sink temperature over approx. 60 Grad. This is to be interpreted as an over-temperature warning. With this output the fan module (available as an option) can be controlled automatically. The condition is indicated with an LED. If the heat sink temperature exceeds 70 degrees Celsius, the power drive is disabled.
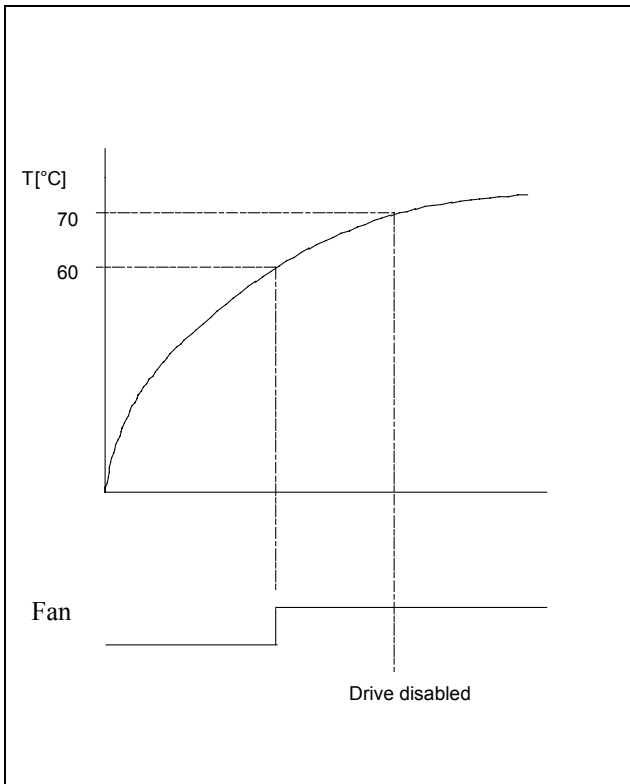
UB,GND: (Power Supply)
The power drive can be operated within a range of 21 to max. 40 Volt. It must be guaranteed that the power supply output voltage does not exceed 40 Volt at no-load operation and +10% mains voltage and that there is a sufficient charge capacitor connected of at least 6800yF. An active ballast circuit prevents over-voltages caused by generator operation at rapid decelerations. This condition is indicated with an LED that must only shortly be lit.

Motor cable connection
Under no circumstances the motor cable must be disconnected during operation. Induction voltages can destroy the power drive. For this reason it is important to have a good connection between the motor cable wires and the screw terminals.

Motors current setting: (approximate values)
The motor current can very easily be set with the potentiometer. Generally it can be said that only as much current is set as necessary. The following table of settings can be helpful.

Fully CCW	1,0 A
9 O'clock	1,2 A
12 O'clock	1,5 A
3 O'clock	2,0 A
Fully CW	2,5 A

Motor current setting
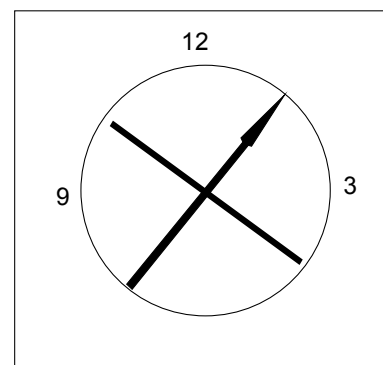
The set motor current will be reduced at higher step frequencies because of the motor inductance. The result is a reduction of the motor torque (see motor specifications of the motor manufacturer). A high current motor version with low impedance is recommend.

Automatic current reduction

The automatic current reduction is activate by setting the jumper „CURRENT REDUCTION". The motor current is reduced to approx. 60% of the set motor current.
The power dissipation of the motor and the power supply is reduced significantly.
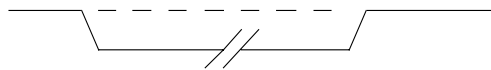The current reduction is activated if the pulse input is inactive for more than 100ms.

At pulse frequencies of less than 10 Hz it is possible that the current reduction is very shortly activated. To avoid this, the start/stop-frequency should be step much higher than this 10 Hz.

The current reduction can be blocked if the pulse input remains at static high signal level.

Immediately after an active pulse input the nominal current is set again
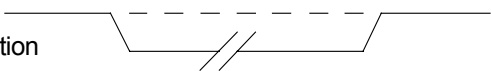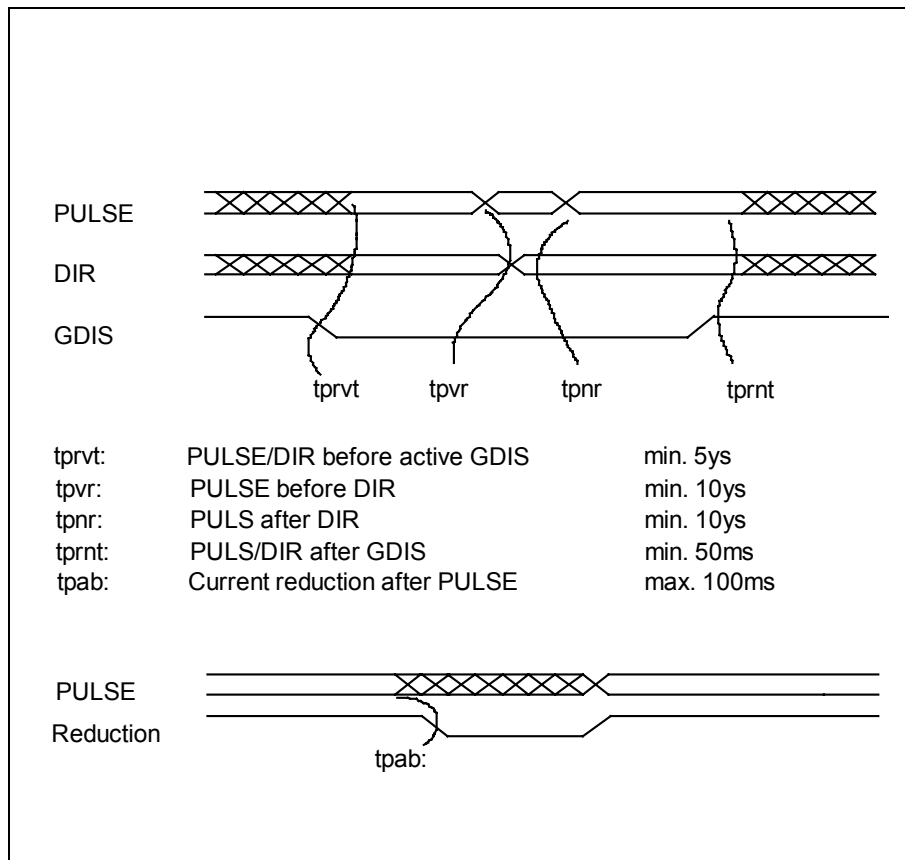
Error mode

The readiness signal will be switched off. The motor is switched off. The ready LED is switched off. The error condition is memorized and can only be reset by activating the inputs „GDR". The error mode is initiated if the temperature exceeds approx. 70°C

Signal Timing

PULSE

DIR

GDIS

tprvt   tpvr   tpnr   tprnt

tprvt:	PULSE/DIR before active GDIS	min. 5ys
tpvr:	PULSE before DIR	min. 10ys
tpnr:	PULS after DIR	min. 10ys
tprnt:	PULS/DIR after GDIS	min. 50ms
tpab:	Current reduction after PULSE	max. 100ms

PULSE

Reduction

tpab:

Board Dimensions

125

117

100

91,5

32

alle holes 3,5mm

Technical Data:

Module supply:
Absolute max. supply voltage:	42 V max.
Min. supply voltage	21 V
Recommended supply voltage:	38 V
Active ballast circuit:	> 46V
Supply voltage ripple:	2 Vss max.
Input current at 35V/Im =max	1,5 A max.
Starting current:	<3,0 A
Fuse:	4,0 A mt
Charge capacitor:	10000 yF
Supply cable wire cross section:	0,75 mm²
Distance to the charge capacitor:	1,0m max.

Motor connection:
Cable cross section:	0,75 mm²
Cable length:	10 m max

Signal input interface: 5V (24V optional)
Input type:	Opto coupler, reverse polarity proof	
Input voltage:	min.	4 V (21V)
	max.	6 V (28V)
	nominal	5 V (24V)
Input current		15 mA (10mA)
Pulse width:	min.	5ys
Pulse rise time:	max.	10ys

Signal output interface:
Output type:	Opto coupler, reverse polarity proof	
Switching voltage:	min.	3 V
	max.	30 V
Switching current:	max.	50 mA
Output resistance:		220 Ohm
Load:		only ohmic

Motor current setting:
Potentiometer	CCW position:	1,0 A
	CW position:	2,5 A
	linear in between	

! Forced air cooling is necessary for motor currents higher than 1,5 A

Temperature monitoring:
Warning, Output „Fan on":	60 °
Shut off:	70 °

Current reduction active at pulse frequency:
Pulse width:	5ys	10ys	50ys	100ys
Current reduction.:	50Hz	30Hz	20Hz	15Hz

Ambient conditions:
Temperature:	40° max
UL94V-1 all components	
IP00	

Trouble Shooting:

Motor has no holding torque moment, although voltage is connected
Motor voltage is below the min. value
Power drive is switched off via the input „GDR/OFF"
Over-temperature shut off is still active

Motor generated holding torque but does not execute steps
Input „GDR/GATE" is active
Pulse level is too low (24V interface)

„TEMP"-LED is lit immediately after power-on
The heat sink was not able to cool down sufficiently

Sudden crackling noises in the motor
The motor is operated at the low voltage limit
Bad contact of the motor connection

The motor starts but does not reach the end velocity
The motor voltage is too low for the required speed
Motor current set too low
Acceleration ramp set too high
Motor wires too long and/or too thin
Power drive is under dimensioned and voltage drop is too high

Motor looses steps and drifts
Control signal amplitudes are too low
Control signal rise times are too high
Noise on signal wire is too high (Shielding ?)
Wiring concept is not optimal (all ground signals must be wired in a star configuration to a common ground potential)
Mechanical shaft coupling slips

The motor vibrates at pulse frequency but does not start
Start/Stop-Frequency too high
Motor windings wrongly connected or broken cable
Automatic current reduction remains active (to little pulse duration at low pulse frequencies)
Motor current set too low

Automatic current reduction does not work
Pulse input remains active after the last pulse
Jumper is not set

Over-voltage LED is lit often/continuously
! The supply voltage is too high

The motor gets very hot
Up to 85 degrees Celsius should be no problem